

Both syntactic function and structural position play an active role in on-line correferential processing

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Background

- The choice of an antecedent for a pronoun is based on the prominence of the available entities in the discourse: the more salient an antecedent is in the discourse the less marked and informative (more reduced) will be the anaphoric expression referring to it ([1])
 - BUT, what defines the prominence of an entity in, particularly, intra-sentential domains?**
 - Single-factor proposals vs. Multifactorial perspectives
- Single-factor proposals
 - Syntactic function** (Subjecthood): Null Pronouns (less informative expressions) are preferred to retrieve sentential SUBJECTS while Overt Pronouns (more informative) are preferred to retrieve NON-SUBJECT entities ([2] and [3] for EP; [4] for BP; [5] for Italian; [6] for Spanish; among others)
 - First-mentioned** entities are very prominent, regardless of their syntactic status ([7] for English; [8] for Spanish)
- Multiple-factors perspectives
 - Many factors influence pronoun resolution
 - Gender information and Accessibility ([9], in English)
 - First-Mention and Subjecthood ([10] and [11], in Finnish; [12], in Estonian)
 - Topic and Focus ([13], in English)

These studies have shown that many factors contribute to saliency ascription. However, some aspects may have been not deeply explored due to the characteristics of the tested languages. For instance, English is neither a free word order language nor a pro-drop one (no null SUBJECTS are allowed) and, in the studies with Finnish and Estonian, free word order languages, only overt pronouns and demonstratives were used to test pronoun resolution preferences.

AIM OF THE PRESENT STUDY

Contrast the weight of syntactic function and order of mention on prominence ascription during pronoun processing and interpretation. To do so we tested Portuguese complex sentences with SVO or OVS main clause orderings, followed by a juxtaposed temporal adverbial subordinate clause. The SUBJECT of the subordinate clause is either a null or an overt ambiguous pronoun that must be identified by an antecedent in the previous clause.

Experiment

Participants: 24 adult native speakers of European Portuguese

Stimuli: 20 experimental items in 4 conditions ((1)-(4)) + 40 fillers

(1) Main clause SVO order + null pronoun (Null_SVO)

The mechanic_{SUB} worked with the engineer_{OBL} in the garage when [he] remodeled the competition car.

O mecânico trabalhou com o engenheiro na oficina quando Ø remodelou o carro de competição.

(2) Main clause OVS order + null pronoun (Null_OVS)

With the engineer_{OBL} worked the mechanic_{SUB} in the garage when [he] remodeled the competition car.

Com o engenheiro trabalhou o mecânico na oficina quando Ø remodelou o carro de competição.

(3) Main clause SVO order + overt pronoun (Overt_SVO)

The mechanic_{SUB} worked with the engineer_{OBL} in the garage when he remodeled the competition car.

O mecânico trabalhou com o engenheiro na oficina quando ele remodelou o carro de competição.

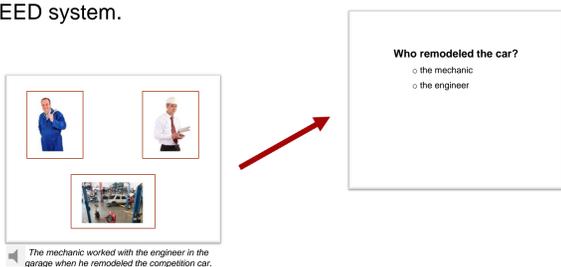
(4) Main clause OVS order + overt pronoun (Overt_OVS)

With the engineer_{OBL} worked the mechanic_{SUB} in the garage when he remodeled the competition car.

Com o engenheiro trabalhou o mecânico na oficina quando ele remodelou o carro de competição.

Procedure: **Visual World Paradigm:** participants listened to sentences while viewing pictures with the representation of the two mentioned characters and with the location of the action described in the main clause. At the end of each stimulus, participant had to answer to a final interpretation question (**Questionnaire**)

Eye movements were registered, at a 500Hz rate, with a SMI IVIEW X™ HI-SPEED system.



Hypotheses & Predictions

H1: Prominence depends only on Syntactic-function information, hence the null pronoun will retrieve always the SUBJECT and the overt pronoun will be preferred to retrieve the OBJECT.

H2: Prominence depends on the Order of Mention information, and so the null pronoun will prefer the entity that is first-mentioned and the overt pronoun will prefer the second mentioned entity.

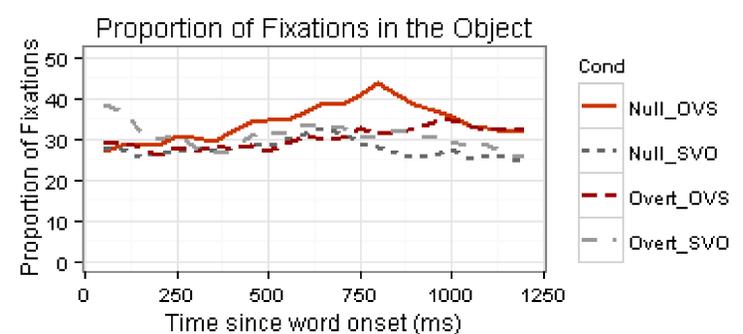
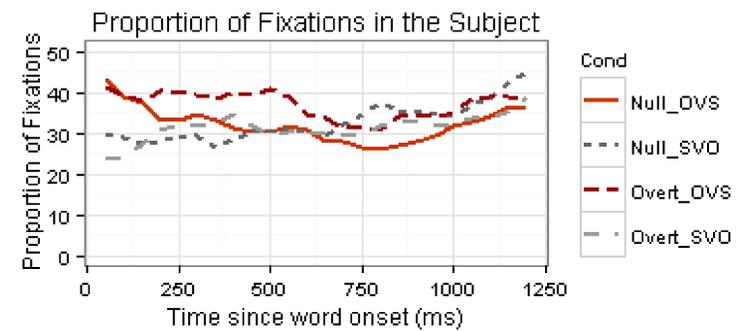
H3: Prominence is the result of the combination of various factors, namely Syntactic-function and Order of Mention. Therefore there will be different results depending on the combination of different linguistic information, for instance, null pronoun-SUBJECT relationship will not be as straightforward as expect if SUBJECT is not the first-mentioned entity, or overt-OBJECT, if the OBJECT is the first-mentioned entity.

Results

Visual World Paradigm analysis

- Growth Curve Analysis, from [14], with log transformation, from [15]
- Gaze data on the Object from 200ms to 1400ms after pronoun/verb onset
- Time course of fixations in the Object was analyzed with cubic orthogonal polynomial

		Estimate	Std. Error	t. value	p
(Intercept)	[F1]	-16.270	0.2700	-6.025	<0.001
	[F2]	-11.690	0.1160	-10.074	<0.001
ot3	[F1]	-0.6081	0.1517	-4.008	<0.001
	[F2]	-0.4320	0.1435	-3.011	0.0026
Pron2	[F1]	0.3026	0.2218	1.364	0.172
	[F2]	0.1731	0.1528	1.133	0.257
Order2	[F1]	0.5515	0.2649	2.082	0.037
	[F2]	0.2353	0.1726	1.363	0.173
Pron2:Order2	[F1]	-0.6167	0.1255	-4.912	<0.001
	[F2]	-0.5161	0.1187	-4.349	<0.001

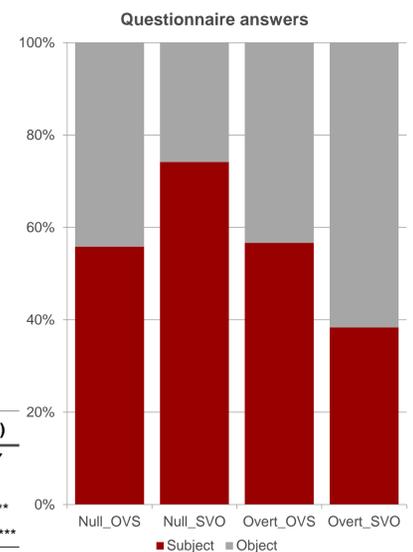


Questionnaire analysis:

- Following [16], answers were analyzed with the glmer() function, family="binomial"
- Number of Subject answers

	Subject	Object
Null_OVS	56%	44%
Null_SVO	74%	26%
Overt_OVS	57%	43%
Overt_SVO	38%	62%

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	0.2535	0.2282	1.11	0.2667
PronP	0.0365	0.2666	0.14	0.8911
OrderSVO	0.8786	0.2851	3.08	0.0021**
PronP:OrderSVO	-16.807	0.3930	-4.28	0.00002**



Discussion and Conclusions

All analyses show: (i) No effect of pronoun; (ii) Order effect (except VWP F2 analysis); (iii) Interaction effect.

Analyzing VWP data, we can see that the condition with more looks towards the SUBJECT is the Overt_OVS condition (until, approximately, 750ms) and the condition with more looks to the OBJECT is condition Null_OVS (from 250ms until 1000ms).

Questionnaire data show that the condition with more SUBJECT answers was Null_SVO and the condition with more OBJECT answers was Overt_SVO. Conditions with OVS structure have almost the same number of SUBJECT and OBJECT answers, independently of the type of the pronoun.

OVS order led to: (i) with Null, a decrease of the number of SUBJECT answers and an increase of proportion of looks towards the OBJECT; (ii) with Overt, a decrease of the number of OBJECT answers and an increase of proportion of looks towards the SUBJECT.

Overall, our results suggest that different types of information, like Subjecthood and Order of Mention, contribute to saliency ascription differently, depending on if they are combined or pitted against each other. And so, the relation between Null-SUBJECT and Overt-OBJECT is not as straightforward as suggested by other studies.

We interpret these results as favoring our Third Hypothesis: prominence is the result of the combination of various factors, namely Syntactic-Function and Order of Mention. That is, as proposed by [13], saliency is not a monolithic concept.

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